YUKON STATE OF THE ENVIRONMENT INTERIM REPORT 2000

AN UPDATE OF ENVIRONMENTAL INDICATORS

Yukon
Renewable Resources

Acknowledgements

Reviewers and Contributors

Yukon Government:

Susan Thompson, Aaron Foos, Bryan Levia, Bengt Pettersson, Rick Farnell, Jean Carey, Rick Ward, Janine Kostelnik, Kate Moylan and Gerry Perrier (Renewable Resources). Pat Brooks and Lynn Richards (Environmental Health). Bob Kuiper and Rod Hill (Economic Development).

Federal Government:

Gerry Whitley, Bill Slater and David Sherstone (DIAND Water Resources). Sandy Johnston and Pat Milligan (Fisheries and Oceans Canada). Jeff Monty, David Milne and John Bartlett (DIAND Forest Resources). Patricia Mandl (Health Canada). Vic Enns (Environment Canada).

Other:

Craig Gardner (Alaska Department of Fish and Game). David Hik (University of Alberta). Larry Shipman, Wayne Tuck, Paul Graham, Jim McLeod and Jackie Hynes (City of Whitehorse). Karl Stellbrink (Raven Recycling Depot).

Yukon Council on the Economy and the Environment:

Rick Buchan, Louise Bouvier, Natalie Edelson, Daryn Leas, Ernie Bourassa, Roger Alferd, James Grattan, Bill Mann, Ralph Nordling, Louise Ranger, Andy Williams.

Elders Contributing to this State of Environment Report:

Stella and Paddy Jim (Champagne and Aishihik First Nation) and Roddy Blackjack (Little Salmon/Carmacks First Nation). Traditional Knowledge Coordinator, Robert Lee Jackson of CYFN.

Consultant:

Sarah Locke, Whitehorse, Yukon

Project Coordination:

Yvonne Harris, Manager Policy and Planning, Department of Renewable Resources, Government of Yukon
Director of Policy and Planning: Don Hutton

Cover Photo: Government of Yukon

Department of Renewable Resource 2000
Canadian Cataloguing in Publication Data
Main entry under title: Yukon State of the Environment Interim Report 2000
ISBN: 1-55362-001-1
Published: April 2001

Copies Available From:
Yukon Department of Renewable Resources
Policy and Planning Branch
Box 2703 Whitehorse, Yukon, Y1A 2C6
Phone (867) 667-5634 Fax (867) 393-6213

Table of Contents

Introduction 2
Air Quality 3
Whitehorse Air Quality 5
Water Quality 7
Solid Waste 9
Recycling 11
Forests 13
Wildlife 16
Salmon 23
Fresh Water Fish 26
Data Sources for Figures 28
Footnotes 29

INTRODUCTION

Tracking Change

The Yukon Environment Act requires a state of the environment report to be completed once every three years, with interim reports in the intervening years. The focus of this interim report is on environmental trends and indicators.

The purpose of State of the Environment (SOE) reporting, as outlined in the Environment Act, is to provide early warning and analysis of potential problems for the environment; to allow the public to monitor progress towards the achievement of the objectives of the Environment Act; and to provide baseline information for environmental planning, assessment and regulation.

The State of the Environment Report does not make recommendations, set policy, or present a report card on the environment. It does, however, provide us with important information to help us make the right decisions to build a sustainable economy and conserve a healthy environment.

The SOE Report is designed to answer four basic questions:

- What is happening in the environment?
- Why is it happening?
- Why is it significant?
- What are we doing about it?

Where possible, indicators should be used to answer these questions and demonstrate whether environmental changes are positive or negative. For the purposes of this report, the emphasis has been placed on updating trend information from the 1999 SOE and including newly-released data, such as the air quality information for downtown Whitehorse.

Information from this report comes from a variety of sources, including previous SOE reports, personal communications, and technical reports.

AIR QUALITY

Greenhouse Gases in the Yukon

- Estimated CO_2 emissions increased by 25 kilotonnes since 1995 when last reported in the Yukon SOE (Figure 1).
- Increased levels of CO_2 are believed to be one of the major causes of global warming.
- Canada's mean temperature has increased by one degree Centigrade in the last 100 years.
- Yukon's ten warmest years fell between 1980 and 2000.
- A changing climate could mean more than higher temperatures; it could also affect vegetation, wildlife, fish, permafrost, rain and snowfall, among other things.
- The impacts of climate change are expected to be more severe at higher latitudes. In the northern Yukon, significant warming trends have already occurred between March and July over the last three decades.[1]
- The transportation sector produces most of the Yukon's greenhouse gases (Figure 2).
- Canada signed the Kyoto* protocol in 1997; in 2000, the international community was unable to conclude a treaty on global warming aimed at curbing greenhouse gases. However, work in that regard has continued and Canada remains committed to the Kyoto Protocol. In February 2001, the Government of Canada committed large sums of money to curbing greenhouse gases across Canada through their Climate Change Action Fund.
- Government of Yukon initiatives to curb greenhouse gases include: the Green Power Initiative, a second wind turbine on Haeckel Hill, support for micro-hydro sources, and a program to encourage energy efficient residential buildings.

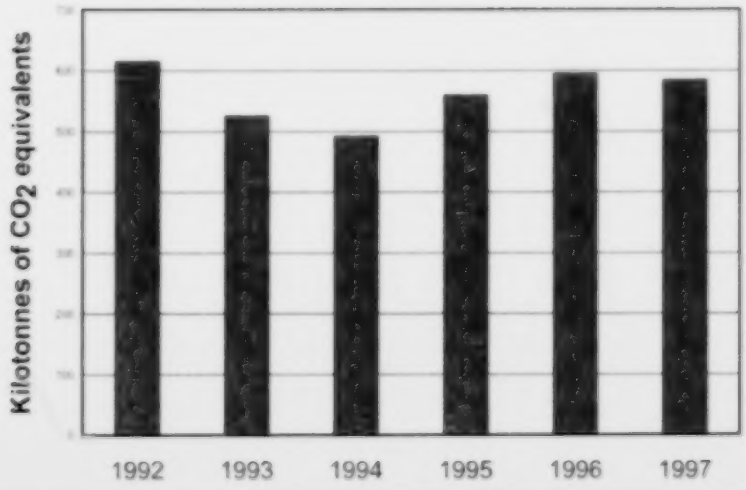


Figure 1: Annual emissions of carbon dioxide in the Yukon 1992 to 1997
Carbon dioxide emissions are estimated in kilotonnes of carbon dioxide equivalents. Kilotonnes of carbon dioxide equivalent is a standard measure for GHG emissions, expressing the global warming potential of various gases over 100 years in terms of carbon dioxide equivalents; i.e., one tonne of methane has 21 times the atmospheric impact of one tonne of CO_2.

***Kyoto Protocol**: international climate change agreement which, if ratified, will put legal limits on the volume of GHG emissions that can be produced by countries.

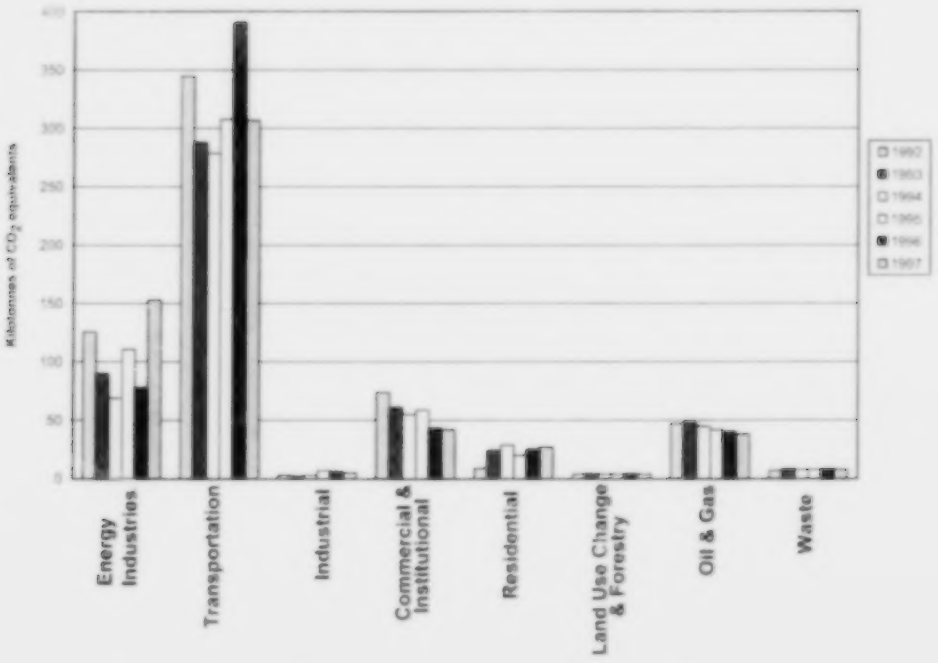


Figure 2: Yukon carbon dioxide emissions by sector 1992 to 1997

The emission categories conform with Intergovernmental Panel on Climate Change (IPCC) protocols.

- Energy industries include fossil fuel industries, electricity and steam generation, and mining. Greenhouse gas emissions from wood heating are not included in these estimates.
- The industrial category includes manufacturing, construction and industrial processes.
- Residential emissions are primarily from space heating.
- Land use changes include tree harvesting and clearing of land.
- The oil and gas category reflects flaring of natural gas at the Kotaneelee Gas Field.

Whitehorse Air Quality

- The Whitehorse air quality station monitors concentrations of carbon monoxide (CO), nitric oxides and Total Suspended Particulate Matter (TSP). Trend data is given for CO and TSP. Monitoring of nitric oxides has been sporadic, and not enough data is available to make any justifiable conclusions on trends.
- With only rare exceptions, Whitehorse air quality meets or exceeds national standards set to provide adequate protection for humans and the environment. When compared with air quality in other Canadian cities and towns, Whitehorse air is consistent with the national mean or average.
- The only air quality monitoring station in Whitehorse is located next to the parking lot at the Law Centre. People are more likely to leave their cars idling there when the weather is cold, so carbon monoxide levels recorded at this site may be higher than in other areas of Whitehorse. As well, this station measures total suspended solids (TSP) and TSP levels are more likely to be lower in the downtown than in the residential areas where wood burning stoves are used.

Carbon Monoxide

- Carbon Monoxide (CO) levels in Whitehorse have decreased since 1995 when last reported in the Yukon SOE (Figure 3).
- CO at high levels can represent an acute health risk.
- The decrease in CO emissions is most likely linked to warmer winters, when less firewood is burned and vehicle engines operate more efficiently, causing less pollution.
- 75% of CO emissions are caused by motor vehicles, especially poorly tuned ones.

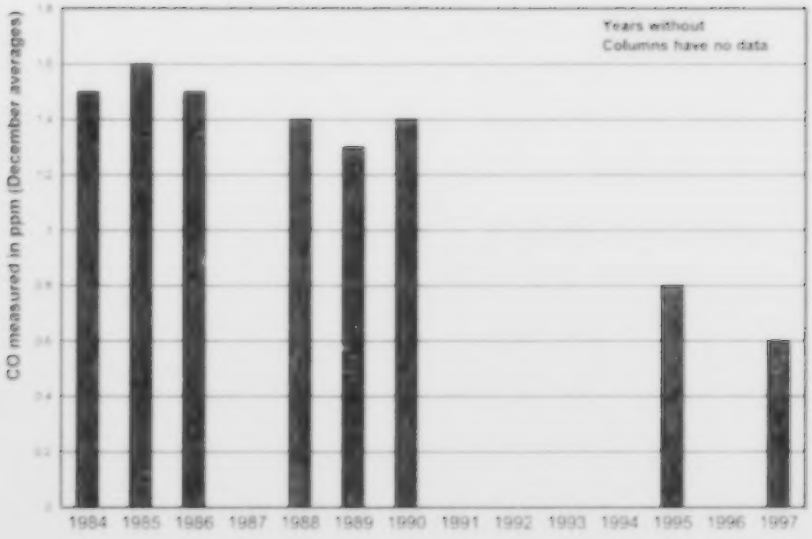


Figure 3: Carbon monoxide (CO) in downtown Whitehorse 1984 to 1997
Carbon monoxide trends are shown for the month of December as concentrations typically increase in mid-winter. CO is measured in parts per million (ppm).

Total Suspended Particulates

- Levels of Total Suspended Particulates (TSP) have dropped dramatically over the last 27 years; declines have leveled off since 1991 when last reported in the Yukon SOE (Figure 4).
- TSP can affect human health; especially susceptible are infants, children, pregnant women, senior citizens and cigarette smokers.
- A City of Whitehorse by-law requires all newly installed stoves meet Environmental Protection Agency (EPA) emission standards.
- Installation of a new TSP sampling unit in 2001 will provide data on a continuous basis so that monitoring agencies will be alerted immediately when episodes of poor air occur.

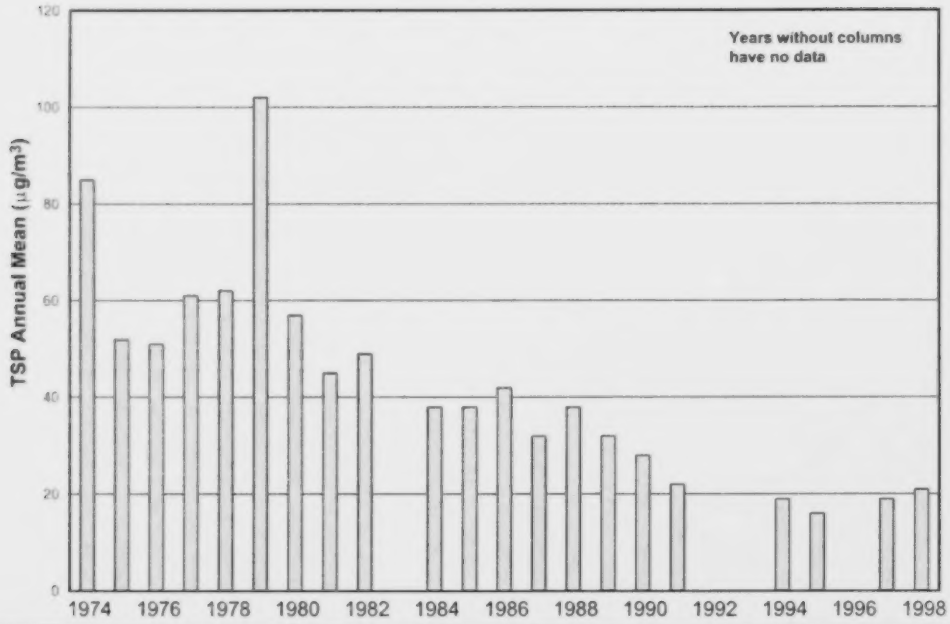


Figure 4: Total Suspended Particulates (TSP) in downtown Whitehorse 1974 to 1988
Smoke, soot and dust all contribute to TSP. Decreases in levels of TSP are most likely linked to improvements in woodstove efficiency, decreased dust levels due to more paving of streets, and lower fuel consumption during warmer winters. [4]

WATER QUALITY

- There is a lack of available data for tracking trends in water quality in the Yukon. Most efforts at long-term monitoring have been cut by DIAND because of funding constraints.
- The Yukon has a small population and limited industrial development, and in general water quality in the Yukon is very good.[3]
- Environmental Health Services Branch of the Yukon Government has primary responsibility for monitoring drinking water quality, and is currently evaluating the procedures for monitoring.
- The aim is to standardize certain procedures, such as the frequency with which communities submit water samples to its laboratory, and to ensure that adequate testing is taking place. In the longer term, the government is also working on drinking water legislation.[4]
- Carmacks sewage undergoes primary treatment (screening and aerating) before being discharged into the Yukon River, while Dawson City sewage is screened but the sewage is not aerated. Aeration is the process that helps bacterial breakdown.
    - Dawson is currently operating without a water licence, but is preparing a new licence application with plans for secondary sewage treatment.[5]
    - The water licence for Carmacks requires the community to upgrade its sewage treatment system; plans are now underway for a new sewage lagoon downstream of the community.
- At Mount Nansen, Faro and United Keno Hill mines, there is a potential for contaminated water to be released into the environment because of discharges from underground workings, filling of open pits, and problems with containment ponds and treatment systems.
- At both Mount Nansen and United Keno Hill mines DIAND has stepped in to manage the properties and control water quality.
- The Faro property is presently under the management and control of a court-appointed interim receiver while a plan of arrangement is being negotiated. The costs incurred by the interim receiver in environmental monitoring, maintenance of structures and water treatment are currently being borne by DIAND (approximately 90%) and the Yukon Government (approximately 10%).
- At the former Clinton Creek Mine, unstable waste rock and tailings piles have failed, damming two creeks and creating two artificial lakes. Failure of either dams would likely result in the discharge of large quantities of asbestos-laden sediment into the Yukon River, northwest of Dawson City.[6]

First Nation participants in the Traditional Knowledge component of the State of the Environment work often expressed concerns regarding water quality:

I am not against mines. But it's got to be used for healthy use, not to damage the land; not to damage the water and leave. More Indians need to get involved with the mines to explain how we used the land before. Not to leave cyanide behind; that they clean up before they go away (Roddy Blackjack, Little Salmon/Carmacks First Nation).

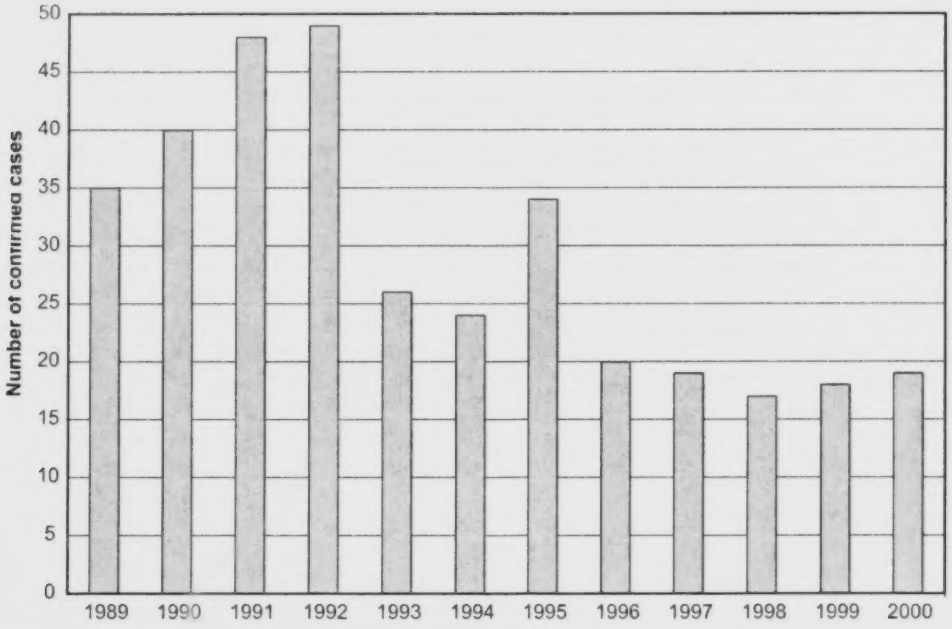


Figure 5: Giardiasis cases per year in the Yukon 1989 to 2000
Giardia lamblia is the name of a protozoa or microorganism that can cause a gastro-intestinal illness in humans. Not all cases are reported and evidence suggests that the number of cases is probably higher than indicated. Public health officials think that the trends in the Yukon reflect public awareness of the issue. *

Giardiasis

- During years when there has been more media coverage of giardiasis, or it has been given a higher profile by public heath officials, the number of reported cases has been higher. In the Yukon, records are not detailed enough to trace where people have contracted the illness.
- Giardiasis, sometimes known as "beaver fever," can cause cramps, nausea and diarrhea. Giardia is a microscopic parasite that inhabits the small intestines of mammals. People contact giardiasis most often by drinking contaminated water.
- Giardiasis can be a public health threat, particularly when it contaminates municipal drinking water.
- Most municipal water license holders, such as the City of Whitehorse, take monthly water sample tests for giardia. The number of giardia cysts found in the untreated water typically rises somewhat in spring, but levels in Whitehorse are very low compared with raw water quality for other Canadian cities.
- In Whitehorse, the raw water is chlorinated to control coliform bacteria and reduce giardia. While chlorination effectively kills coliform bacteria, this chemical needs a sufficient amount of contact time with the untreated water to kill giardia. In 2002, the City of Whitehorse plans to install a chlorine contact chamber and possibly a filtration system to control giardia more effectively.

SOLID WASTE

- There are 25 solid waste disposal sites throughout the Yukon. However, data on waste deposited in solid waste disposal sites is only available for the Whitehorse landfill.
- The Yukon Government brought in new regulations on solid waste in 2000. Permits are now required for designing, operating, maintaining, and closing dumps and landfills on Commissioner's land in the Yukon. Burning of garbage is still allowed, though not recommended, and requires an Air Emissions permit.
- On average, Canadians generated almost one tonne of waste per capita/per year in 1998. This figure includes industrial, commercial and residential waste and includes both the waste disposed of in the landfill and recycled.[10]
- Governments and businesses in Canada generated 20.8 million tonnes of waste, or about .690 tonnes of waste for every Canadian in 1998. This amount (which does not include residential waste) is a reduction from the .73 tonnes produced per capita in 1994. [10]
- Residential sources generated about .33 tonnes per Canadian in 1998, of which about 30 percent was diverted from landfills or incinerators.[10]

Waste Diverted From Land Fills

Province/City	Per Cent of Waste diverted from Landfills
Nova Scotia[11]	50%
Whitehorse	14%
British Columbia[12]	42%

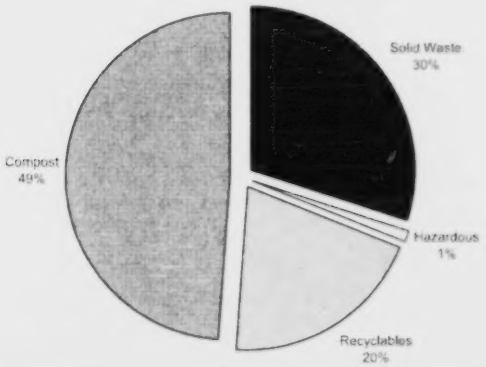


Figure 6: Composition of the Whitehorse waste stream 1994
The composition of the City of Whitehorse waste stream was analyzed in 1994. The results show that 69 per cent of the waste could be either composted or recycled.

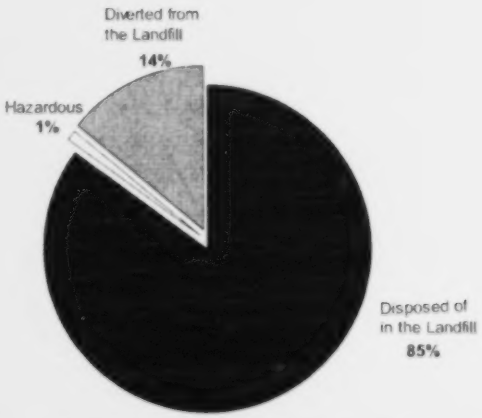


Figure 7: Percent of Whitehorse Waste Diverted from the Landfill in 2000
Whitehorse diverts 14% of the waste stream. As shown in Figure 6, there is a potential to divert 69% of the waste.

City of Whitehorse Solid Waste

- The 14% that was diverted includes 350 tonnes of compost and the 2,145 tonnes of material recycled by the three Whitehorse recycling firms.
- Out of the total 350 tonnes of compost recycled at the landfill, 51 tonnes was generated by the 235 households participating in the Waste Watch Program. The City of Whitehorse is assessing feasibility of expanding this program to the Crestview area on a trial basis.
- Three Whitehorse recyclers - Raven Recyling, P&M Recycling, and Helping Hands – diverted a total of 2,145 tonnes of recyclable materials from the landfill. Raven, a non-profit society, diverted 1,964 tonnes of recyclable materials (Figures 8-10). Materials diverted include commodities shipped out of the Yukon as well as materials recycled at the landfill.
- In previous SOEs, trend data for Whitehorse solid waste was shown in cubic metres. Beginning in 2000 solid waste data from the Whitehorse landfill was measured in metric tonnes. As a result, comparisons between 2000 and previous years are not available.
- The City is analyzing the amount of waste generated by businesses, in order to address ways to reduce the commercial waste stream.

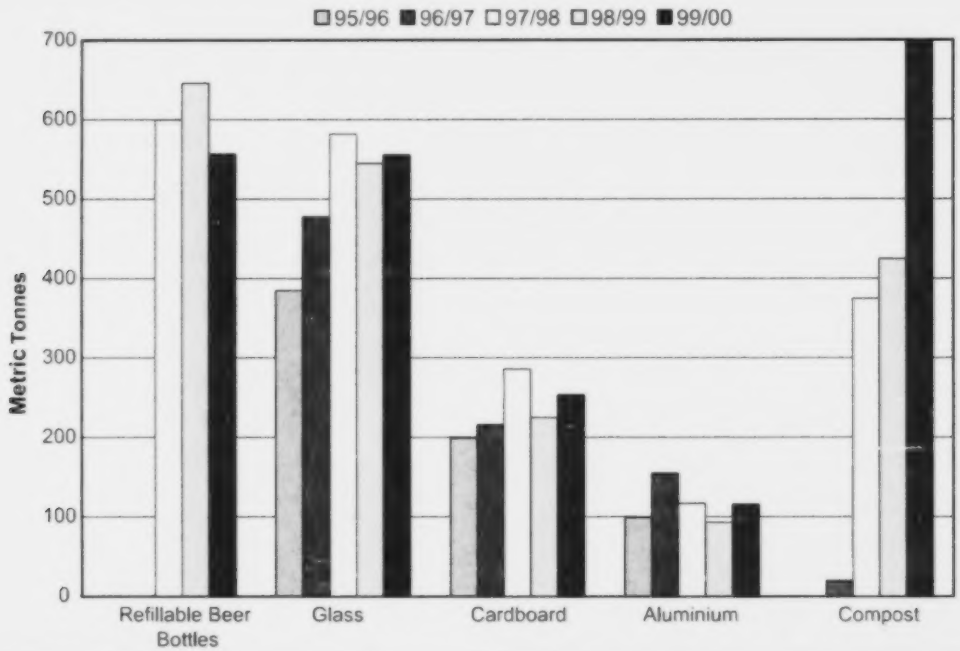


Figure 8 (Chart #1): Commodities diverted by Raven Recycling in 2000
The large increase in the amount of compost delivered to the Whitehorse landfill in 1999/00 is most likely linked to the installation of the weigh scale there in July 2000, rather than to a substantial increase in actual amounts of compost. Compost amounts were previously estimated in cubic metres, and could have been underestimated all along.

Recycling Centres

- There are 30 recycling centres in the Yukon, seven of which are located in the Whitehorse area. The commodities collected at the community recycling centres are measured by volume. Since the conversion from volume to weight is difficult, this report only documents the tonnes of recycled commodities handled by Raven Recycling, the non-profit organization that collects most of the items from the communities.

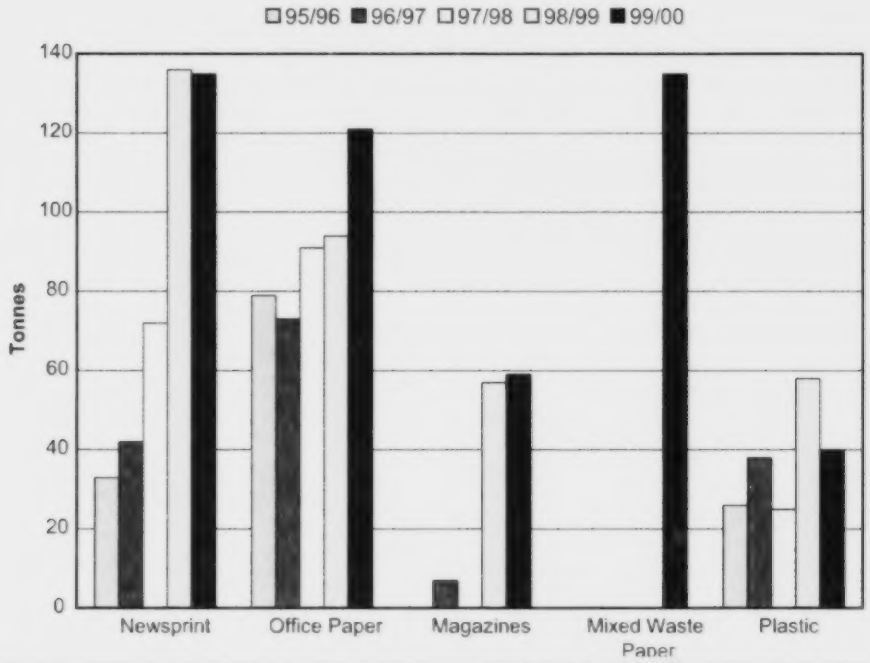


Figure 9 (Chart #2): Commodities diverted by Raven Recycling in 2000
Collection of mixed waste paper only began in 1999/00. The plastic category includes items such as yogurt containers and non-refundable plastic containers.

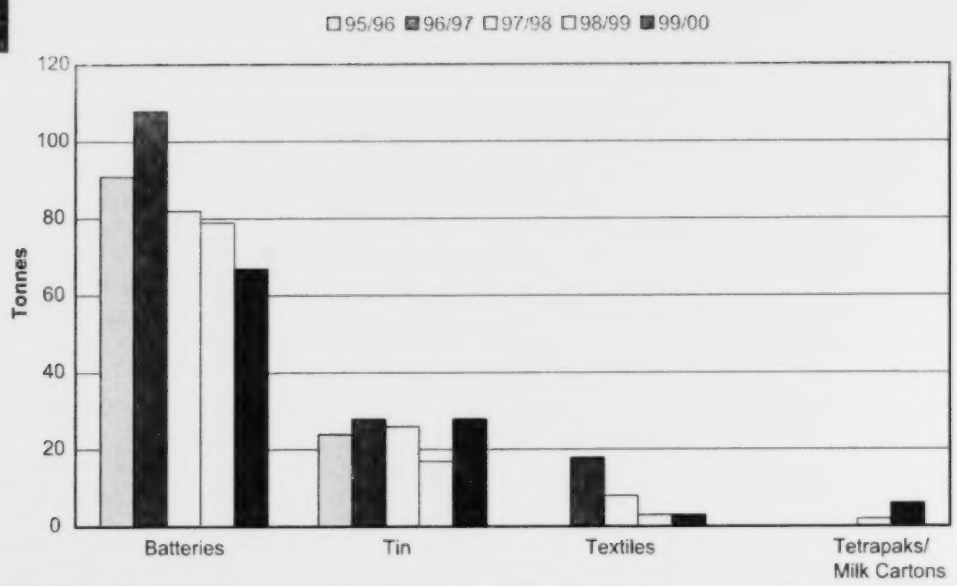


Figure 10 (Chart #3): Commodities diverted by Raven Recycling in 2000
Collection of tetrapaks and milk cartons began in 1998.

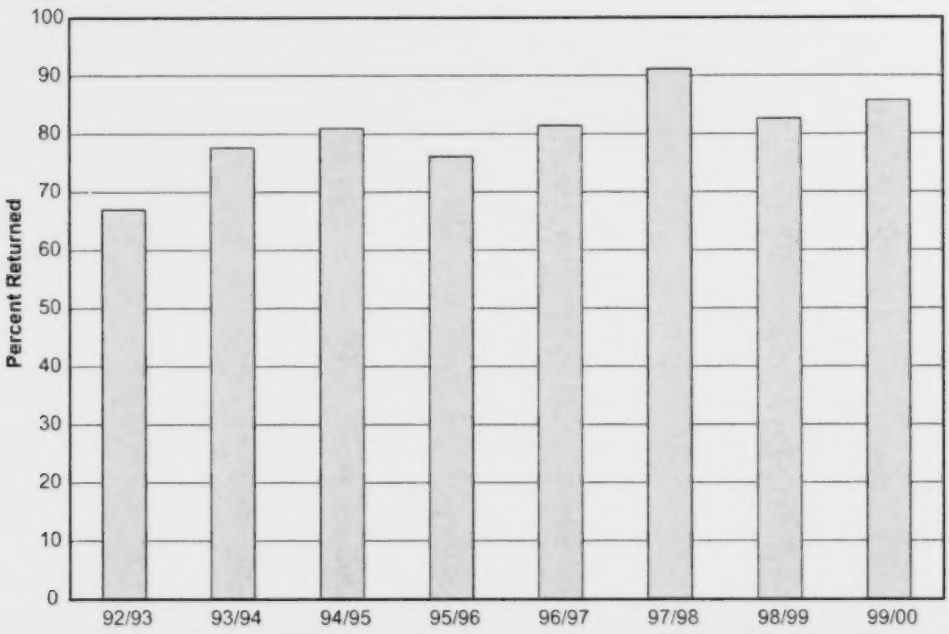


Figure 11: Return Rates 1992 to 2000: Yukon Beverage Container Recycling Program
The Yukon Beverage Container Recycling Program has been very successful at promoting high return rates on recyclable containers.

FORESTS

- Annual harvest volumes in the Yukon have decreased in the last two years because of lower timber prices (Figure 14). [1]
- The Yukon's only long-term forest tenure is located in the southeast Yukon.
- A new draft Timber Harvest Agreement (THA) process is now under discussion by the federal government. Public consultation on this draft was in progress in the spring of 2001.
- The number of harvested areas that were replanted increased substantially in the 1999/00 season, a result of the Elijah Smith Forest Renewal Program.
- Forest research is taking place in the southeast Yukon on spruce budworm in mature forests, regeneration surveys, natural regeneration and reforestation.
- A vegetation inventory of the forested portions of the Yukon is in its second year. Meadows and riparian areas will also be mapped.

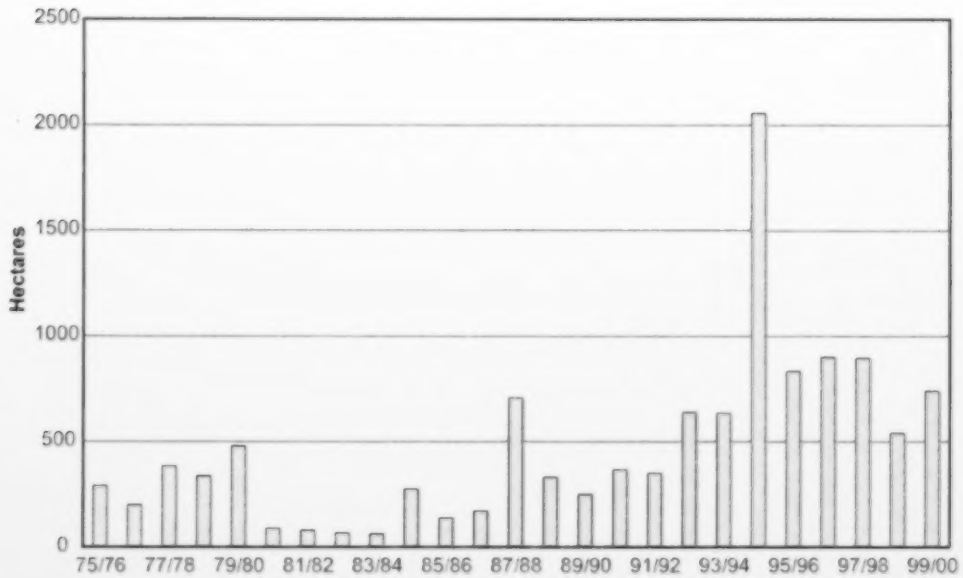


Figure 12: Yukon forested lands harvested 1975 to 2000
Estimates for harvested areas are based on an average harvest of 200 cubic metres of wood per hectare for the southeast Yukon. The total amount of land affected by forest harvesting would be higher as this estimate does not include roads, landings and salvage logging.

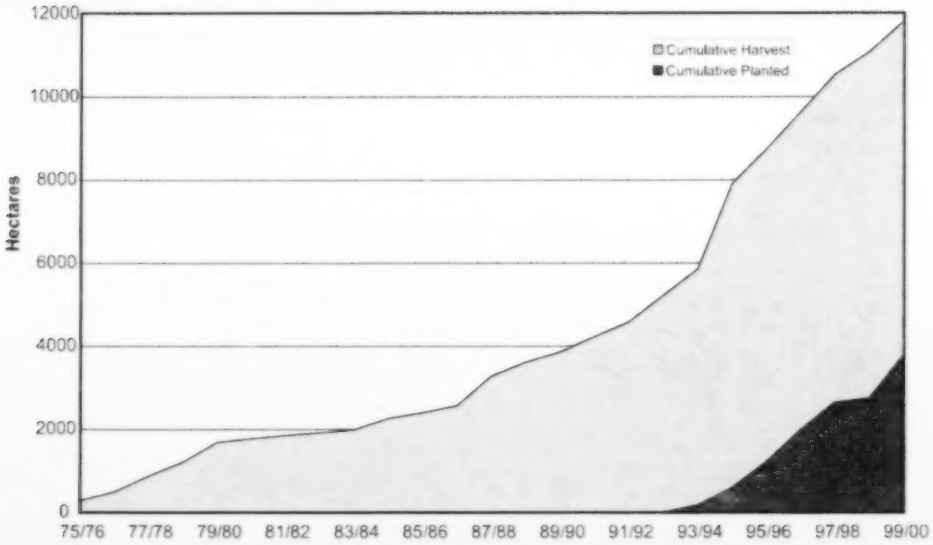


Figure 13: Balance between lands harvested and planted in the Yukon 1975 to 2000
This figure shows the cumulative area harvested and planted (each year's total is added to the previous year's total). Increases in tree planting along with natural regeneration assist in ensuring sustainable forests.

Lodgepole Pine

Black Spruce

White Spruce

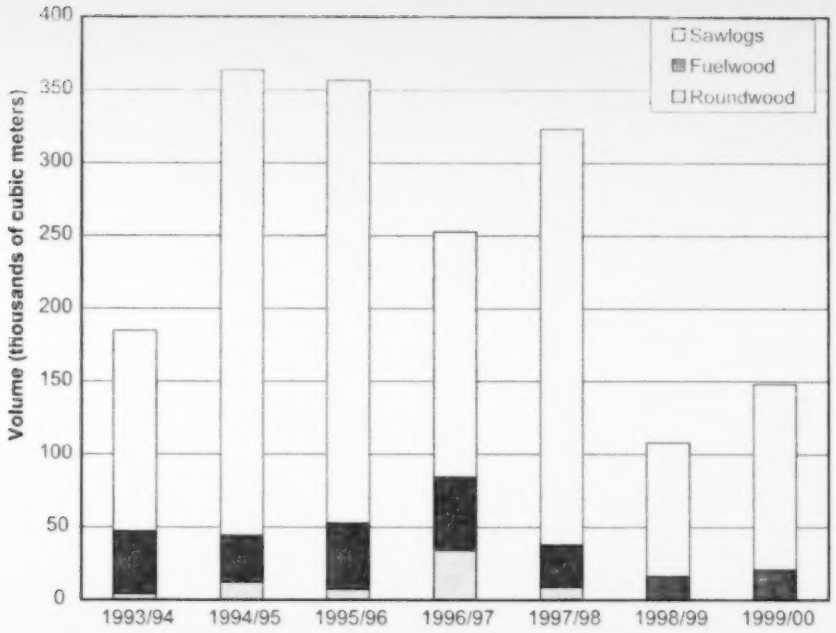


Figure 14: Yukon Primary Forest Production 1993 to 2000
Fewer trees were harvested between 1998 and 2000 primarily because of decreased demand due to lower timber prices. Roundwood, a small part of the harvest in all years, includes building logs, posts and railings.

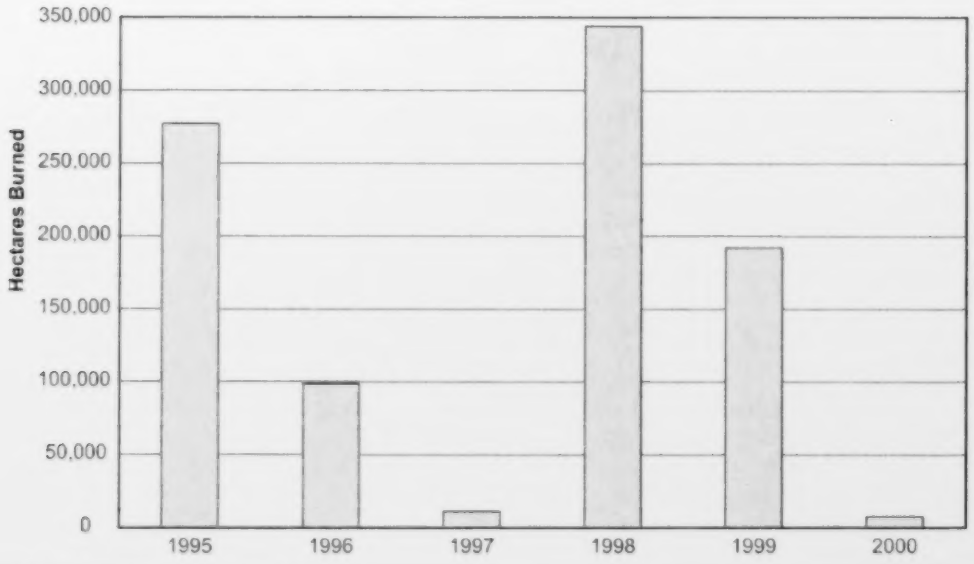


Figure 15: Area of Yukon forests burned per year 1995 to 2000
The strong fluctuation in number of hectares burned per year is usually linked to weather, with more fires occurring in hot dry weather. Some climate models predict that climate change will increase the number and severity of forest fires.

FISH AND WILDLIFE

Overall, most wildlife populations in the Yukon are stable and considered to be healthy. However, certain species have been identified as "at risk" by the Committee on the Status of Endangered Species in Canada (COSEWIC). This national committee evaluates the status of all wildlife species in Canada and identifies those most at risk.[14]

Endangered: a species facing imminent extirpation or extinction.

- bowhead whale
- *Eskimo curlew (designated in 2000; possibly already extinct)

Threatened: a species likely to become endangered if limiting factors are not reversed.

- wood bison
- *anatum peregrine falcon (downlisted from endangered in 1999)

Wood Bison

Special concern: a species of special concern because of characteristics that make it particularly sensitive to human activities or natural events.

- grizzly bear
- wolverine
- squanga whitefish
- short-eared owl
- tundra peregrine falcon
- *blackline prickleback (Arctic Ocean population)
- Species listed by COSEWIC may be healthy in the Yukon, although internationally the species may be endangered or of concern (e.g. grizzly bear).

Fortymile Caribou Herd

- The Fortymile Caribou Herd was once the largest caribou herd in Alaska or the Yukon, with animals ranging as far south as Lake Laberge. Numbers of animals in the herd have varied from estimates of more than half a million in the 1930s to an historic low of 6,500 animals in 1973.

Caribou

- Management efforts between 1995 and 2000 helped increase the herd to its current size of almost 35,000 animals (Figure 16). Efforts included:
  - protecting habitat within the herd's range;
  - substantially reducing harvest of the herd;
  - encouraging more trapping of wolves in the herd's calving grounds and summer range;
  - non-lethal predator control, such as trapping and relocating young wolves and sterilizing pairs of alpha wolves.[15]
- If the herd continues to increase in size, it could begin to expand back into its historic range.

Blackline Prickleback

* indicates the species has been added to the list or the designation changed since the 1999 SOE. There is little information on the two species added by COSEWIC (the Eskimo curlew and the blackline prickleback) except that the fish habitat of the prickleback is primarily in the shallow bays off the NWT Beaufort Coast. The woodland caribou-boreal herd primarily inhabits Saskatchewan and Alberta where it is threatened.

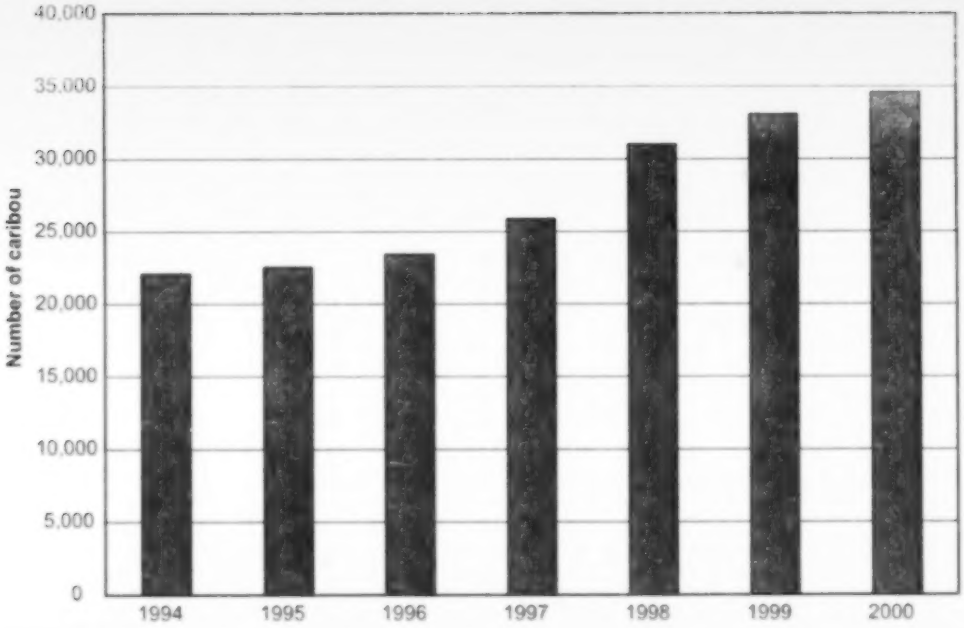


Figure 16: Fortymile Caribou Herd
June census figures show the increases in herd size between 1995 and 2000, the period when recovery efforts were being made. Before this time, the calf survival rate was low so the herd was not increasing in size. The five-year recovery program will end in late 2001.

Stella Jim

Elder Stella Jim recalls seeing the Forty Mile caribou when she was young.
Yes, I remember when the big caribou herd used to come right down to Whitehorse. When the first big herd came in, they came right through the city here. Last time that I see them come down this way, down the hill there, it was 1942 (Stella Jim, Champagne and Aishihik Elder).

Moose

- An estimated 65-70,000 moose are distributed throughout most of the Yukon, and are even seen on the Arctic Coast.
- On a territory-wide basis, their populations are considered to be stable or slowly increasing (Figure 17).[16]
- A repeat survey run in the northern Richardson Mountains in 2000 found that moose numbers had increased by 67 percent since the 1989 survey. Overall densities were quite low, but when only the areas of habitable range were considered, meaning the creek and river valleys, densities climbed to 730 moose per 1,000 square kilometres.
- Moose may be expanding their range to the north at least partly because of climate change.

Paddy Jim speaks about the traditional laws passed on by his people:
They know how to look after fish and game. They would tell us, okay so this mountain is a good place to hunt moose. We'd get moose there, but we won't go to the same place again. Pretty soon the game comes back (Paddy Jim, Champagne and Aishihik Elder).

Paddy Jim

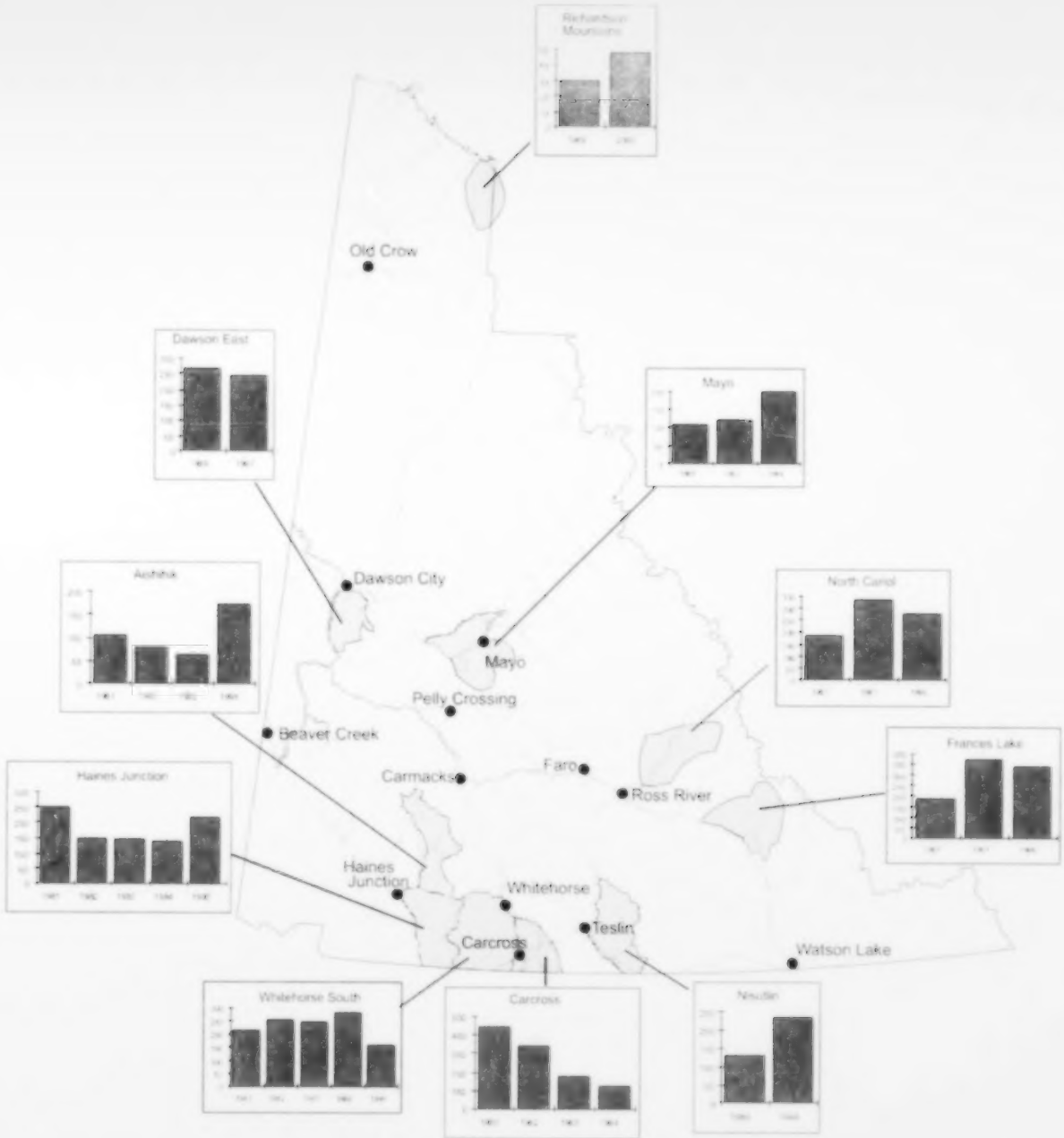


Figure 17: Population trends in selected moose survey areas.
Moose surveys are conducted throughout the Yukon. This figure only shows selected surveys where trend data is available. The graphs show moose per 1000 sq. km.

Peregrine Falcons

- Based on the year 2000 peregrine falcon survey, it is estimated that there are at least 230 to 250 pairs of falcons in the Yukon.
- Populations of peregrine falcons can be an important indicator of environmental health, particularly for persistent pesticides in large continental food webs.
- While recovery of peregrine falcons has been complete in the Yukon, populations in southern Canada are still small and in Central and South America, where this falcon spends the winters, dangerous pesticides are still in use.

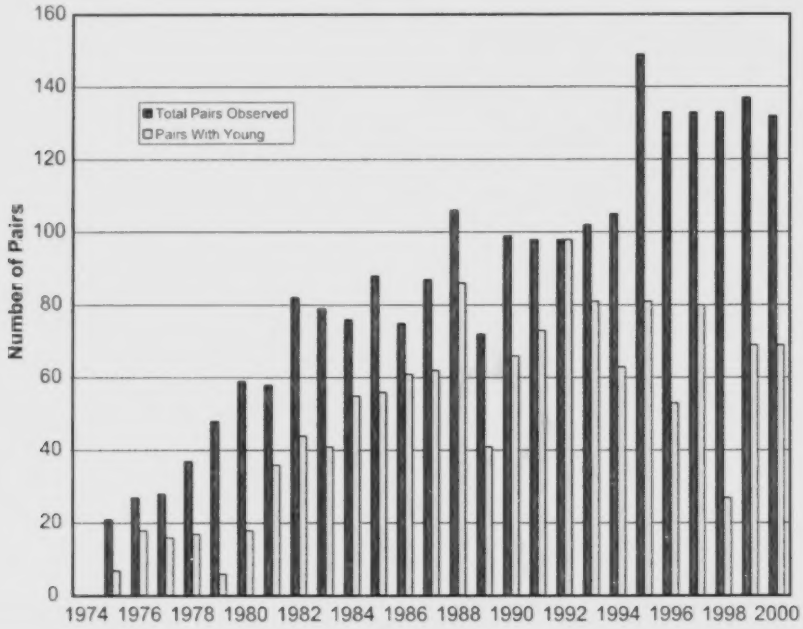


Figure 18: Anatum peregrine falcons in Yukon 1974 to 2000
Extensive surveys of Anatum peregrine falcons are carried out once every five years, but some areas are resurveyed yearly, and these results are extrapolated to other areas.

Anatum Peregrine Falcons

- These falcons are still increasing their numbers, but at a slower rate than observed previously, raising some concerns about long-term productivity in this species (Figure 18).
- Both occupancy at established nest sites and production of young in 2000 appeared to be lower than observed rates in the recent past.
- The slowdown in population increases could be a normal adjustment in a species that has recovered dramatically over the last few decades. It is not known why productivity has declined among the anatum peregrine falcons.[17]

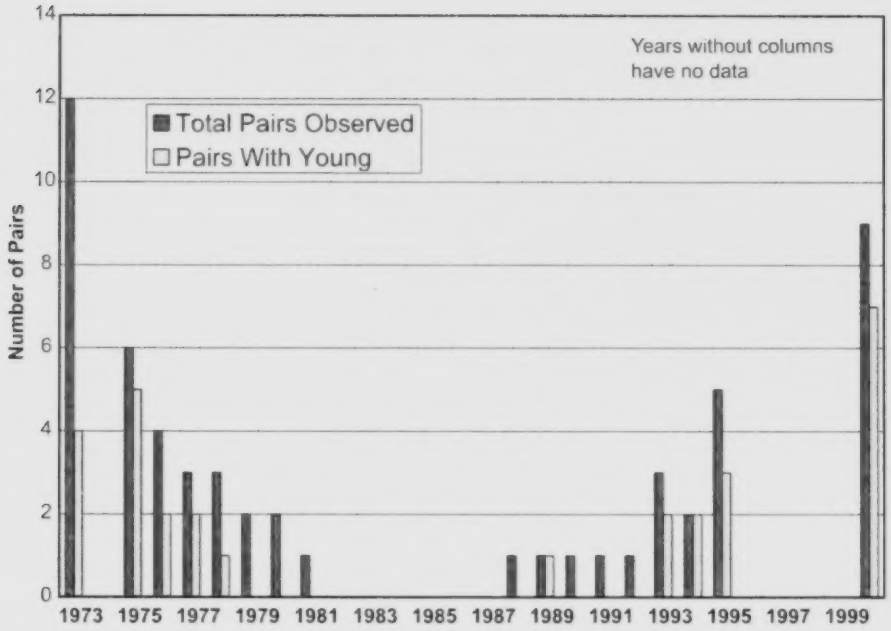


Figure 19: Tundra peregrine falcons – North Yukon 1973 to 2000
The North Yukon population represents a subspecies of peregrine falcon, *Falco peregrinus tundrius* or tundra peregrine falcon. Falcon surveys were not conducted in the years in which no results are shown.

Tundra Peregrine Falcons

- In 1999, the tundra peregrine falcon was downlisted from endangered to threatened.
- Tundra peregrine falcons were more productive than the anatum falcons, as 78 percent of the breeding pairs on the North Slope produced young in 2000 (Figure 19).

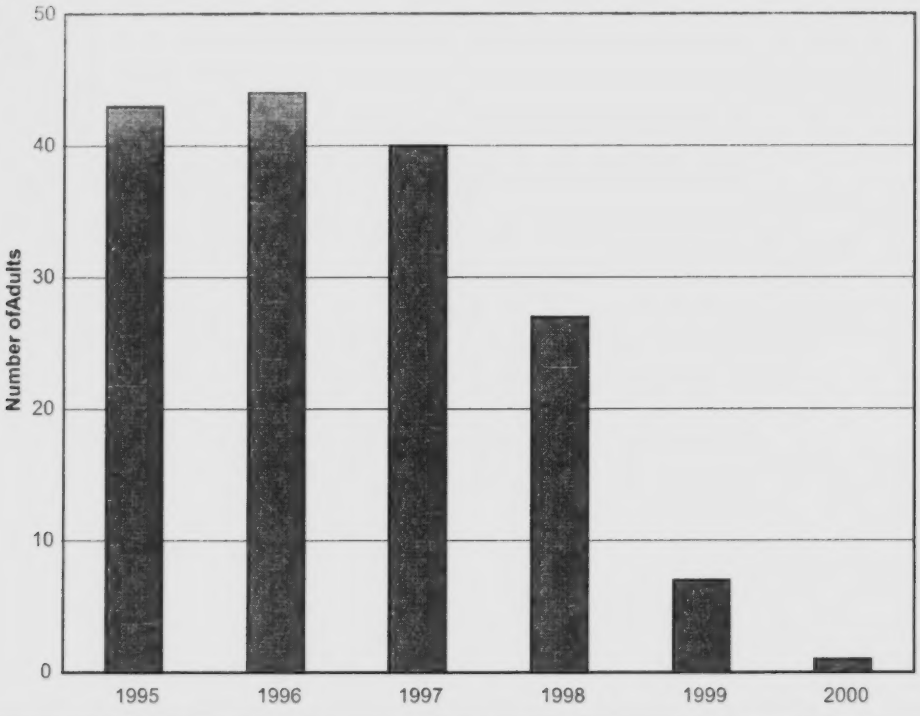


Figure 20: Pikas in the Ruby Range of the southwest Yukon
During the summers of 1995-97, collared pika numbers in a 1.5 square kilometer study area in the Ruby Range were relatively constant, numbering around 40 individuals in the spring. Populations began to crash in 1998, and only one pika was found in the spring of 2000.

Pika

Pikas

- The decline in the pika population has coincided with warmer winters in the southwest Yukon (Figure 20).
- Mammals in alpine ecosystems, such as pikas, could be useful indicators of climate change since predation does not play as major of a role there as it does in the boreal forest.
- This decline has also been noted anecdotally in other alpine areas in southwest Yukon.[18]
- Higher temperatures increase the moisture content of the snowpack, thus decreasing its insulation values for animals such as pikas living underneath the snow cover.
- Higher temperatures also cause more ice to form in the snowpack, making it more difficult for pikas to forage in what is called the subnivean layer of the snowpack.

Salmon

- In 1998, 1999 and 2000, runs of chinook salmon in the Yukon River were among the lowest runs ever recorded, but the reasons for this decline are unclear (Figure 21).
- The numbers of chum returning to the Fishing Branch River were also at historic lows for these three years.
- It is assumed that many of the salmon are dying while in the ocean-phase of their life cycle.
- In low water years, as occurred in 1998 and 1999, bears and other predators can more easily catch salmon on their spawning grounds. Increased predation could affect overall salmon numbers.
- If returns remain low for several years in a row, stocks can become depressed and take a long time to recover.
- Fisheries managers are working to conserve salmon stocks by:
  - intensive monitoring of escapement
  - controlling harvest levels in order to meet spawning escapement targets
  - setting harvest levels based on abundance.
- In 1999, both Canada and the United States renewed the Pacific Salmon Treaty. A specific agreement for Yukon River salmon has been successfully negotiated, through various management arrangements between the two countries.

Salmon used to be so abundant:
I tell you the straight truth, that each one of the people in three days time had five hundred fish each for their cache. Filled up, already cut, smoked and dried (Stella Jim, Champagne and Aishihik First Nation).

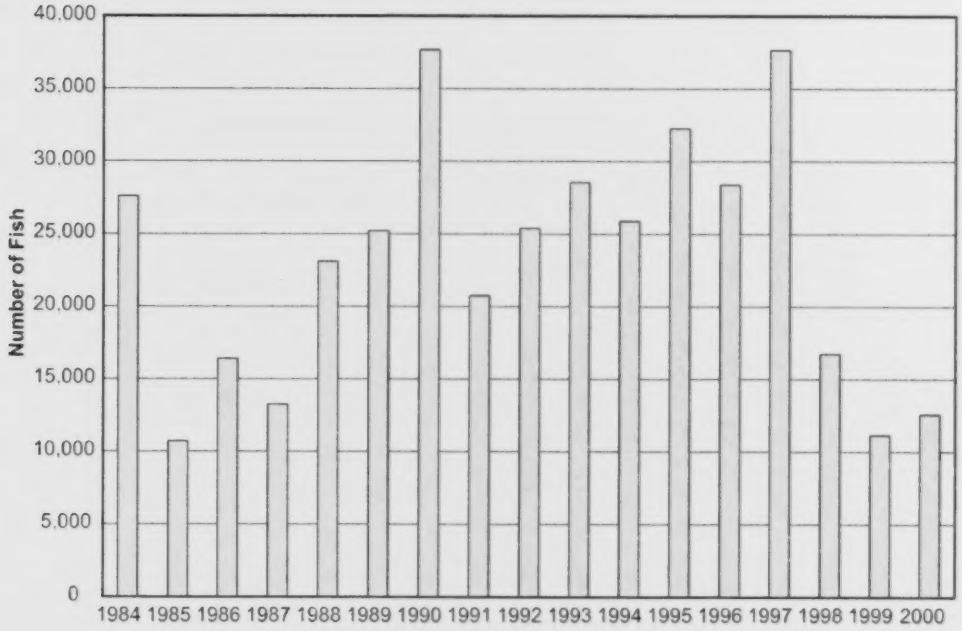


Figure 21: Chinook Salmon escapement – Upper Yukon River 1984 to 2000
Escapement refers to the number of salmon returning to their spawning grounds. Most chinook salmon are between five and seven years of age when they return to the spawning grounds.

Chinook salmon in the Yukon River are the first wild salmon population in which the parasite *Ichthyophonus hoferi* has been detected. This organism is ubiquitous in herring populations. In 1999 and 2000, studies of chinook salmon throughout the Yukon River drainage showed that the number of infected fish increased as they migrated upstream, but then dropped off sharply between Dawson City and Whitehorse. More research is planned in 2001 to investigate whether the diseased fish are dying en route. As salmon are a cold water fish, it is suspected that warmer-than-normal water temperatures in recent years could have made the salmon more vulnerable to infection.[9]

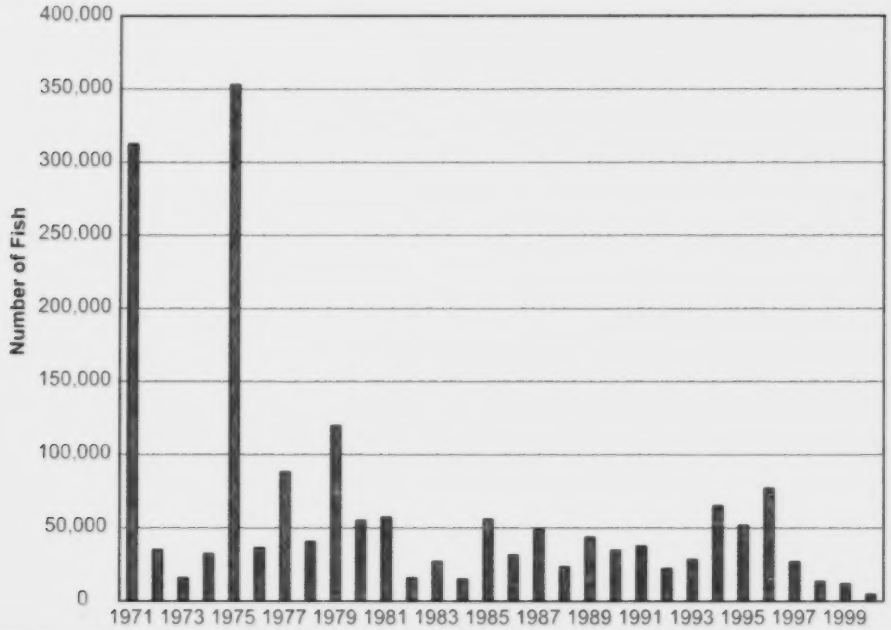


Fig. 22: Chum escapement - Fishing Branch River 1971 to 2000
The number of chum salmon returning to the Fishing Branch River in the northern Yukon has crashed dramatically in the last few years. For the years 1990-1999, the average return was 37,107 fish, compared to 5,037 returning fish in 2000.

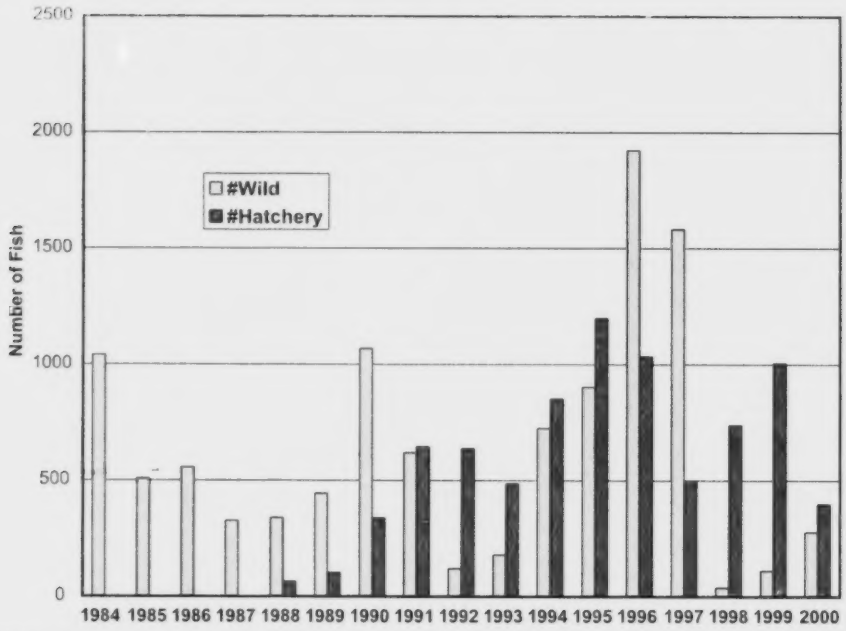
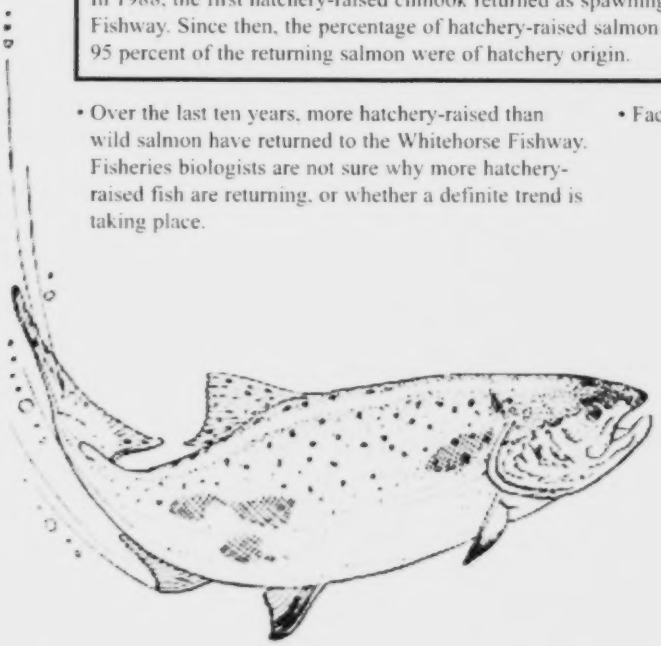


Figure 23: Chinook salmon returns - Whitehorse Fishway 1984 to 2000
In 1988, the first hatchery-raised chinook returned as spawning adults through the Whitehorse Rapids Dam Fishway. Since then, the percentage of hatchery-raised salmon has varied widely, reaching a peak in 1998 when 95 percent of the returning salmon were of hatchery origin.

- Over the last ten years, more hatchery-raised than wild salmon have returned to the Whitehorse Fishway. Fisheries biologists are not sure why more hatchery-raised fish are returning, or whether a definite trend is taking place.

- Factors contributing to this variation could include:
  - the number of fry restocked into spawning streams in a particular year, as this variation could affect the ratio between wild and hatchery-raised salmon returning through the Fishway. For example, if a large number of hatchery fry are released in a year when few wild fry are produced, more of the returning adults could be of hatchery origin as well.[20]
  - the timing of the downstream journey as more fry survive the trip past the Whitehorse Rapids Dam at high water levels than at low. At low levels, fry are sucked through the turbines at the Whitehorse dam, while in higher water, fish can swim over the spillway instead of through the turbines.



Salmon

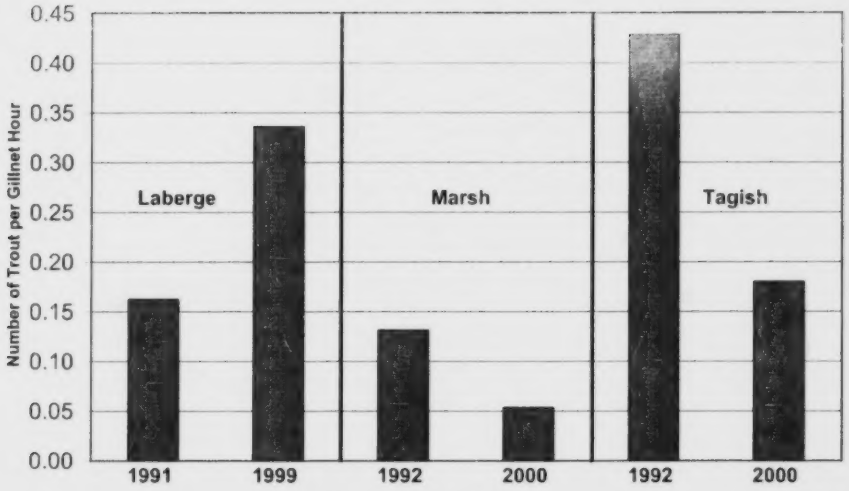


Figure 24: "Catch Per Unit Effort" (CPUE) for three of the Southern Lakes
The number of lake trout captured through netting over a certain period of time is used to calculate a catch per unit effort (CPUE). This relative measure of abundance can be used to evaluate the health of fish stocks in lakes of similar size, productivity and harvest pressure.

Freshwater Fish

- Baseline information has been established on fish stocks in about 70 different lakes in the Yukon. Re-sampling of lakes began in the summer of 1999 so that trends in fish stocks can be determined (Figures 24 and 25). Seven lakes have now been re-sampled.
- Lake trout are the main indicator species for evaluating the health of a lake. They are the most desirable species for recreational, commercial and domestic fisheries. Lake trout grow slowly in cold northern waters, which makes them vulnerable to overharvesting.
- In general, the more remote lakes have the healthiest stocks. Stocks of lake trout have declined in some of the more popular road-accessible lakes due to increased pressure from anglers. On smaller lakes (Lower Snafu, Upper Snafu, Tarfu and Little Atlin Lakes), the stocks did not change significantly between surveys.
- Fisheries managers are attempting to rebuild stocks in certain lakes. For commercial fisheries, strict quotas are set for lake trout. Other regulatory changes include reducing catch limits for certain species and requiring the "live release" of certain sizes of fish in other cases. Fishers are being encouraged to harvest fish more selectively in order to relieve pressure on fish stocks.
- Standardized nets are spaced across the lake and set in diverse habitats, not just in the prime fishing spots. The captured fish are released after they have been identified, measured and weighed.
- The CPUE for lake trout in Lake Laberge has more than doubled between surveys because there has been little angling pressure there in the interim. After the 1991 surveys, Lake Laberge was closed to commercial fishing, while sport fishing and the aboriginal subsistence fishery were voluntarily reduced.
- By contrast, on Marsh and Tagish Lakes, angling pressure has continued even though regulatory attempts have been made to reduce and control the harvest, particularly at the Tagish Bridge. The CPUE for these lakes has declined at a similar rate.

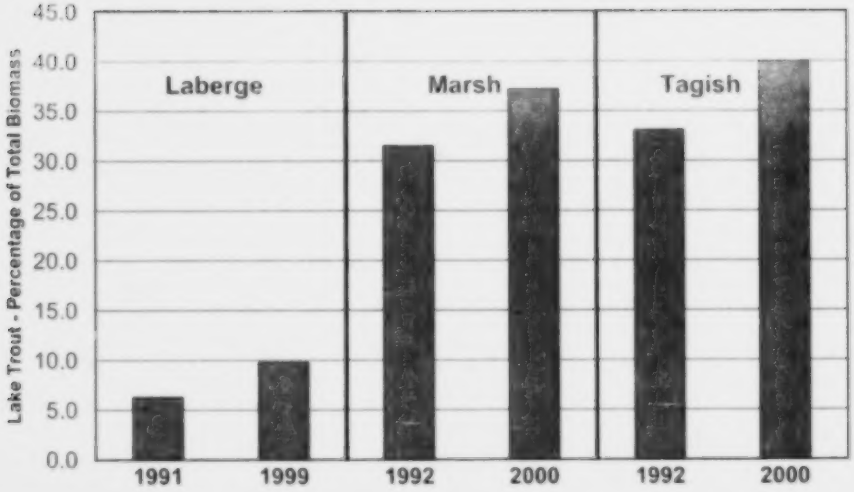


Figure 25: Percent lake trout in three of the Southern Lakes
Fish stocks in lakes are considered to be relatively stable when lake trout make up at least 30 percent of the weight of the total fish catch. The ratio of lake trout to total catch is one of the tools used to develop quotas and regulations. Note that on Marsh and Tagish Lakes, the percentage of lake trout per total biomass increased between surveys, even though the CPUE (Figure 24) decreased for each of these lakes. This difference reflects the fact that the lake trout in these two lakes are big rather than abundant. For example, the 2000 survey on Marsh Lake showed that lake trout make up 37 percent of the total fish biomas, but researchers only caught four lake trout in 65 hours of netting on the lake.

Lake Trout

DATA SOURCES FOR FIGURES

AIR

Fig. 1: Annual emissions of carbon dioxide in the Yukon 1992 to1997
Environment Canada (Vancouver) Greenhouse Gas Division, Pollution Data Branch, Liu, S.

Fig. 2: Yukon carbon dioxide emissions by sector 1992 to1997
Environment Canada (Vancouver) Greenhouse Gas Division, Pollution Data Branch, Liu, S.

Fig. 3: Carbon monoxide (CO) in downtown Whitehorse 1984 to1997
Summary of Whitehorse Ambient Air Quality Data (1998)
Environmental Protection and Assessment Branch
Yukon Department of Renewable Resources

Fig. 4: Total Suspended Particulates (TSP) in downtown Whitehorse 1974 to1998
Summary of Whitehorse Ambient Air Quality Data (1998)
Environmental Protection and Assessment Branch
Yukon Department of Renewable Resources

WATER

Fig. 5: Giardiasis cases per year in the Yukon 1989 to 2000
Health Services Branch, Yukon Communicable Disease Control Unit

SOLID WASTE

Fig. 6: Composition of Whitehorse waste stream 1994
Yukon State of Environment Report 1999, p. 53

Fig. 7: Percent of Whitehorse Waste diverted from the landfill in 2000
City of Whitehorse, Engineering Division and Environmental Coordinator

Fig. 8, 9, 10: Commodities diverted by Raven Recycling
Raven Recycling

Fig. 10: Return Rates: Yukon Beverage Container Program 1992 to 2000
Environmental Protection and Assessment Branch
Yukon Department of Renewable Resources

FORESTS

Fig. 12: Yukon forested lands harvested and planted 1957 to 2000
Department of Indian Affairs and Northern Development, Forest Resources

Fig. 13: Balance between forested lands harvested and planted 1975 to 2000
Department of Indian Affairs and Northern Development, Forest Resources

Fig. 14: Yukon Primary Forest Production 1993 to 2000
Department of Indian Affairs and Northern Development, Forest Resources

Fig. 15: Area of Yukon forests burned per year 1995 to 2000
Department of Indian Affairs and Northern Development, Fire Management

WILDLIFE

Fig. 16: Fortymile Caribou Herd
Alaska Department of Fish and Game

Fig. 17: Moose
Yukon Department of Renewable Resources

Fig. 18: Anatum peregrine falcons
Data provided by Dave Mossop, Yukon College

Fig. 19: Tundra peregrine falcons – North Yukon
Data provided by Dave Mossop, Yukon College

Fig. 20: Pikas in the Ruby Range of the southwest Yukon
Data provided by David Hik, University of Alberta

FISH

Fig. 21: Chinook salmon escapement - Upper Yukon River 1984 to 2000
Department of Fisheries and Oceans Canada

Fig. 22: Chum escapement - Fishing Branch River 1971 to 2000
Department of Fisheries and Oceans Canada

Fig. 23: Chinook salmon returns - Whitehorse Fishway 1984 to 2000
Department of Fisheries and Oceans Canada

Fig. 24: "Catch Per Unit Effort" (CPUE) for three of the Southern lakes
Yukon Department of Renewable Resources, Fisheries Branch

Fig. 25: Percent lake trout for three of the Southern lakes
Yukon Department of Renewable Resources, Fisheries Branch

FOOTNOTES

[1] Russell, Don. October, 1999. *Analysis of temperature and precipitation trends between 1970 and 1999 in the Canadian portion of the Porcupine Caribou Herd range*. Canadian Wildlife Service. Unpublished report.

[2] Environmental Protection and Assessment Branch, Yukon Department of Renewable Resources. 1998.*Summary of Whitehorse Ambient Air Quality Data*. Government of Yukon.

[3] Personal communication. Janine Kostelnik. Environmental Protection and Assessment Branch. Yukon Department of Renewable Resources. January, 2001.

[4] Personal communication.Vic Enns. Environment Canada. February 8, 2001.

[5] Yukon Department of Renewable Resources. 1999. *Yukon State of the Environment Report*. Government of Yukon.

[6] Personal communication. Lynn Richards. Yukon Health and Social Services, Environmental Health Services Branch, Government of Yukon. February 2001.

[7] Personal communication. David Sherstone. Department of Indian Affairs and Northern Development, Water Resources Branch. January 2001.

[8] Personal communiciation. Rod Hill, Yukon Department of Economic Development. March 2001.

[9] Personal Communication. Patricia Mandl, Environmental Health Services Branch, Government of Yukon. February 2001

[10] Statistics Canada. *The Waste Management Industry*. The Daily, October 12, 2000.

[11] Personal Communication. Karl Stellbrink, Raven Recycling Society, Whitehorse, Yukon. March 2001.

[12] Ministry of Environment, Lands and Parks, Province of British Columbia. *Domestic Waste in British Columbia*. March 16, 2001.

[13] Personal communication. Jeff Monty, Department of Indian Affairs and Northern Development, Forest Resources. January 19, 2001.

[14] Environment Canada, Canadian Wildlife Service. *Species at Risk in Canada*. http://www.speciesatrisk.gc

[15] Personal communication. Craig Gardner, Alaska Department of Fish and Game. February 2001.

[16] Personal communication. Rick Ward, Fish and Wildlife Branch, Yukon Department of Renewable Resources. February 2001.

[17] Dave Mossop. *Population Status of the Peregrine Falcon in the Yukon Territory, 2000*. December, 2000. Yukon College. February 2001.

[18] Personal communication. David Hik, University of Alberta. February 2001.

[19] Personal communication. Pat Milligan, Department of Fisheries and Oceans Canada. February 2001.

[20] Personal communication. Sandy Johnson, Department of Fisheries and Oceans Canada. February 2001.